

THE IMPACT OF THE SWEET POTATO
ON PREHISTORIC HAWAIIAN CULTURAL DEVELOPMENT

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ABSTRACT

Recent research in Hawaiian archaeology suggests that commencing about 1000-1100 A.D. substantial change and development occurred in various aspects of prehistoric Hawaiian culture, and this trend continued in at least some respects to European contact. It is clear that the sweet potato was of increasing importance to Hawaiian agriculture during this time. The New World origin of the sweet potato, as opposed to the Asiatic nature of the other Oceanic cultigens, further presents the possibility of a separate and post-initial settlement introduction of this crucial crop into the prehistoric Hawaiian agricultural complex.

The possible temporal alternatives for the arrival of the sweet potato in Hawai'i are considered. The predictable effects of sweet potato introduction at various points in the prehistoric sequence are examined in relation to the actual evidence for major cultural developments: agricultural expansion-intensification, population growth, increasing social complexity, etc. Specific methods are suggested for incorporation into future archaeological research to provide data relevant to the role of the sweet potato in the prehistoric Hawaiian adaptation.

Early Western explorers, beginning with Captain James Cook in 1778, commented repeatedly on the extent, intensity, and quality of native Hawaiian sweet potato (Ipomoea batatas [L.] Lam.) production, particularly in contrast to other areas of Polynesia (Yen 1974: 311-317). As late as 1823 the Reverend William Ellis described extensive agricultural field systems on the island of Hawai'i where sweet potato was the primary crop (Newman 1970: 112-120). These early accounts clearly attest to the importance of sweet potato in the Hawaiian economy at European contact. Late prehistoric Hawaiian culture was characterized by a complex ranked society, high population density, and an economy primarily reliant upon well-developed agricultural systems. The possible role of the sweet potato in the development of these cultural features is our concern.

The sweet potato is unique in that it is the only Polynesian cultigen of American origin (Brand 1971; Yen 1971, 1974). All other Polynesian cultigens are of Asian derivation. Although taro is characterized as the preferred food of the Hawaiians, as a crop sweet potato has several advantages (Handy & Handy 1972: 124-128):

- 1) It can be grown in less favorable locations with respect to sunlight and soil.
- 2) The tubers mature in three to six months as opposed to the nine to 18 months required for taro.
- 3) It requires less labor in planting and less care in cultivation.
- 4) The tubers will keep in the ground without rotting for several months after maturing.
- 5) The sweet potato is not seasonally restricted.

Present evidence indicates that the sweet potato was introduced to Eastern Polynesia from South America sometime after initial settlement, about the first to third century A.D., but prior to the colonization of New Zealand which occurred before 1000 A.D. (Green 1975: 604-624). Carbonized sweet potato fragments have been recovered from archaeological sites in New Zealand (Leach 1976: 145), Easter Island (Rosendahl & Yen 1971: 379), and Hawai'i (Rosendahl & Yen 1971: 383) with dates of 1650-1850 A.D.; 1526 \pm 100 A.D.; and 1425-1725 A.D., respectively. In these areas sweet potato was of major agronomic importance. In contrast, sweet potato was a minor crop and dietary element in central East Polynesia at contact where it was used primarily for pig feed (Yen 1974).

Studies at Palliser Bay provide the earliest indirect evidence for sweet potato cultivation in New Zealand (Leach 1976). Intensive examination of environmental conditions past and present, in conjunction with archaeological excavations, showed sweet potato to be the only possible crop for that particular area. These field systems date to the 12th century A.D., and it is assumed that the arrival and dispersal of the sweet potato predates the systems by a hundred years or more. For Easter Island it has been suggested that the sweet potato arrived with the initial colonizers (Yen 1974: 294) in the fifth century A.D. (McCoy 1976: 10). In Hawai'i evidence for swidden agriculture has been substantiated early in the temporal sequence (Kirch 1975; Green, in press). However, in these Hawaiian sites the specific cultigen has not been identified. Until more direct evidence is available, the possibility of sweet potato introduction subsequent to initial settlement but prior to the establishment of the major dryland field systems remains viable. The necessary agronomic techniques were already an integral part of the Hawaiian's cultural knowledge, but if a more adaptable plant was introduced it could have allowed for intensive exploitation of previously unused land.

In 1823 Ellis described five dryland agricultural field systems on Hawai'i where sweet potato was the primary cultigen (Newman 1970: 114-115). These were located in leeward North Kohala, in Kona between Kailua and Ka'awaloa, at Wai'ohinu and Kapapala in Ka'u, and near Kamaili in Puna. Two of these areas have been investigated archaeologically: the North Kohala system at Lapakahi (Newman 1970; Rosendahl 1972; Tuggle & Griffin 1973) and the Kona system at Kealakekua (Soehren & Newman 1968; Newman 1970: 123-137). Research in Makaha Valley, O'ahu (Green, in press) and Halawa Valley, Moloka'i (Kirch 1975) provide additional data on dryland cultivation in prehistoric Hawai'i.

The earliest indirect evidence in Hawai'i for sweet potato cultivation is from Makaha Valley. Field shelters dated at 1100 to 1300 A.D. were found in stratigraphic association with evidence for swiddening (slash and burn agriculture) (Green 1970: 101). It is assumed that these fields were used for either sweet potato or dry taro cultivation. This initial swidden agriculture was followed by more permanent inland pondfield systems with associated dryland farming (Green, in press). In Halawa Valley, geological and malacological evidence suggest a sequence of forest burning resulting in slope instability and erosion by 1200 A.D. Based on this data, in conjunction with the cultural remains, Kirch (1975: 175-176) suggests that swiddening was probably a major agricultural activity in the valley from the date of initial settlement (ca. 650 A.D.) onward. It was concluded that a quantitative shift in relative emphasis from swidden to pondfield cultivation gradually took place. The extensive field system at Lapakahi dates from the late 1400's to historic contact. It is in this area that the first direct evidence of sweet potato was found. Carbonized sweet potato tuber fragments were excavated from a field shelter in upland Lapakahi with associated dates ranging from 1425 to 1725 A.D. (Rosendahl & Yen 1971; Rosendahl 1972). Less directly, some coastal Lapakahi sites date to about 1300 A.D. (Tuggle & Griffin 1973: 58) and may indicate the initial stages of sweet potato cultivation. Sweet potato tuber skin has also been tentatively identified from one of the Mauna Kea Adze Quarry rockshelters (B.P. Bishop Museum, current analysis). Only one radiocarbon date has been obtained for the rockshelter, 1492 A.D. (corrected), and the identified material is from a layer that is stratigraphically more recent, but definitely prehistoric.

Recent research has led some archaeologists to hypothesize a prehistoric expansion of permanent settlement into the dry leeward areas of Hawai'i beginning as early as 1000 to 1100 A.D. (Cordy 1978). It is suggested that this settlement was accompanied by inland agricultural expansion and substantial population increase, as exhibited by the extensive remains of dryland field systems and numerous coastal habitation sites. There were also certain social developments that took place which resulted in the formation of complex ranked societies during the late 1400's (Hommon 1976). This is in part documented by the appearance of large house sites and heiau (temples) which represent social stratification. The areas affected are notably those in which the sweet potato would be the most productive crop. It is

tempting to suggest that the introduction of this adaptable cultigen was an important factor in these developments. However, evidence to support such an inference has been elusive thus far.

Three alternative time periods are suggested for the introduction of sweet potato to Hawai'i:

- 1) With initial settlement ca. 600 to 750 A.D. (Yen 1973: 81), or possibly as early as 300 A.D. (Cordy 1978: 25). This would mean that the sweet potato was involved with but not the catalyst for the previously mentioned cultural developments.
- 2) At a later date, about 1000 A.D. or somewhat later. The sweet potato could have precipitated or been directly requisite for certain cultural developments (Hommon 1976: 258-269).
- 3) By a historically unrecorded Spanish vessel in the 1500's (Dixon 1932; Stokes 1932). In this case the sweet potato would have been introduced after major cultural developments had taken place.

There is a paucity of both direct and indirect data relevant to the prehistoric presence or absence of sweet potato in Hawai'i. Only the third possibility noted above is seriously questioned by present archaeological evidence. We suggest the following research methods may assist in defining the chronology of sweet potato introduction and establishment in the Hawaiian horticultural complex, as well as identifying the effects this cultigen may have had upon the development of prehistoric Hawaiian culture:

- 1) The controlled archaeological sampling of prehistoric dryland agricultural field systems can be improved. This would be accomplished in part by obtaining consistent samples along two lines of variation in an individual field system, that is, along the longitudinal axis and the inland-seaward axis. Such a sampling procedure, combined with comprehensive absolute dating, should result in a complete view of the development of an agricultural system from its initial stages through European contact.
- 2) Direct evidence is obtainable in the form of sweet potato macrofossils. Archaeological excavations could be concentrated on those sites, structures, and features which will most likely contain preserved sweet potato remains. In addition, specific field recovery techniques can be developed.
- 3) The techniques of macrofossil identification need refinement, and comparative collections and keys should be developed.

- 4) Microfossil identification and analysis is not fully developed in Hawai'i and previous attempts at isolation of archaeological pollen have been relatively unsuccessful for a variety of reasons. However, pollen analysis may still prove productive, particularly in dry areas. It should be noted that for sweet potato pollen low percentages would be expected as the pollen is not windborn and the plant usually was harvested before flowering occurred.
- 5) Climatic-edaphic conditions of a specific micro-environment can be compared to the physical requirements of a particular cultigen as was done by Leach (1976).

Ultimately all of these methods depend on the accurate and reliable dating of archaeological sites through basaltic glass hydration rind measurement and radiocarbon dating techniques.

This very brief discussion of the possible role of the sweet potato in prehistoric Hawai'i is clearly quite preliminary and incomplete. All of the data relevant to this topic have not been recounted nor have all the possible interpretations been noted. However, recent archaeological research and dating in Hawai'i, combined with minimal direct evidence presently available on the sweet potato, is rather enticing. It is possible that a focus on the role of this adaptable food plant could have major explanatory potential in future interpretations of the prehistoric development of Hawaiian culture. Until new data more clearly defines the prehistoric position of the sweet potato, in terms of the time of introduction and the effects upon Hawaiian culture, the concerns raised here remain a legitimate area of inquiry for archaeological research in Hawai'i.

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